4-1-2010

Math Teachers: What Influences Their Teaching Methods?

LiJin Yan
Trinity College

Math Teachers:
What Influences Their Teaching Methods?

LiJin Yan

Educational Studies Program

Senior Research Project

Trinity College

Hartford, CT

Professor Sandler

December 2009

Introduction:

Many students have different opinions about the subject of mathematics. During my time in public schools, I have met some American students who are enthusiastic about learning math and plan to pursue a career that involve the use of math. But there are also many students who despise math and struggle hard to grasp the basic concepts of math in high school. The U.S is known for low achievement rates in mathematics but there are obviously some students in our schools that enjoy and excel in math. Students need to be engaged in the lesson through discussion, group work and less chalk and talk from the teacher. All teachers have different teaching styles and approaches to making sure their students are participating and learning the subject. But what influences math teachers to teach differently? The teacher's education background, personality, social background, experiences in the field, or mastery of the skill may affect his or her teaching methods in the math classroom.

When students are learning math, the teacher's teaching method is a crucial factor to how much the student would understand and retain the material. Teachers appear to lecture and use teacher directed instruction more frequently than using student centered methods to instruct math. (McKinney et al., 2009). They also found that many teachers spend more time on teaching basic computational skills rather than engaging the students in mathematically rich problem-solving experiences. Furthermore, in high poverty schools, teachers implement the "pedagogy of poverty" when they teach their students. The "pedagogy of poverty" is a curriculum that follows a fixed sequence, concentrates on just teaching the students basic skills without enough emphasis on problem solving and reasoning. (McKinney et al., 2009). This article is relevant to what I want to research because it demonstrates that teachers in high poverty schools have the tendency to use

traditional teaching methods, which limit the students' ability to fully understand. They teach less challenging math curriculums rather than implementing methods that are more student and inquiry centered, and offer more challenging math curriculum.

The impact of teaching methods on students' understanding of math can also be seen in Bayazit and Gray's study. Bayazit and Gray (2004) found that teaching practices that differ in a qualitative way will produce qualitatively different learning outcomes. They concluded that using real life situations to convey inverse functions might help students develop conceptual understanding of the topic. A better way to ensure that students are constructing meaningful understanding of inverse functions is to use a variety of appropriate representational systems, examining the concept through conceptually focused and cognitively challenging tasks, and ensuring active involvement of the students in the classroom. This study emphasizes the need for teachers to use visual aids like Venn diagrams and graphs to help students develop a rich understanding in the math concepts that are introduced in the classroom. This finding is important to educational research because teachers and administrators need to know that using qualitative methods would help increase students' engagement in classrooms.

So far, I have talked about how traditional methods of teacher centered lessons are dominant in math classrooms, even though it has been demonstrated by studies that when math lessons are more student centered, the students actually develop a better understanding of the math concepts. Wilson and Gwendolyn (2000) conducted a study where they implemented the Core-Plus Mathematics Project, which is based on the belief that all students can make sense of mathematics. This project encourages the teachers to organize students into groups and class discussions, where they can work together to explore mathematical problems and ideas. The three teachers in the study have taught math for 10 years and have struggled with sharing math

authoritative power with the students. They have problems with sharing math authoritative power with the students because the attention in the classroom is no longer on them, but on the students instead. (Wilson and Gwendolyn, 2000). Teachers also struggle to realize that students can make important connections through group work, even without direct teacher explanation. While the teachers used the Core-Plus Curriculum, they implemented it along with their own teaching styles and preferences. This finding helped me realize that when I am observing the math classrooms in an urban middle school, I might actually see alterations of student centered lessons. This shows that teacher's input and teaching styles have an influence on the curriculum, even if they are all instructed to teach in one specific way. If administrators can find out what exactly influences the teachers' way of teaching in the classrooms, then it can help them recruit teachers who can implement successful engaging strategies that are similar to the Core-Plus Curriculum.

The teacher is a crucial tool when we want to ensure that students are developing a concrete understanding of all the math concepts. Therefore we need to also focus on what kind of teachers are instructing math in the public schools. One of the factors that might influence the way the teacher instructs is his or her cultural and social class background. Cahnmann and Remillard (2002) analyzed the challenges that Arieto, a bilingual Puerto Rican teacher, and Kitcher, a white teacher who mainly teaches minorities, face as they try implementing mathematics reform in a high poverty school. Cahnmann and Remillard (2002) discovered that these two teachers need to teach from perspectives that are unfamiliar to them. Kitcher needs to know how to relate to the students by examining her own cultural assumptions, and realize her expectations of her students. On the other hand, Arieto needs more experience with exploring math ideas more deeply, and use instructive practices that actually engage the students in rich

mathematical thinking. This study showed me that in order to achieve better participation in the math classrooms; teachers need to continuously apply mathematical representations and language from a mathematical and cultural perspective. Administrators need to keep this finding in mind in order to find the best teachers that can relate to the students and teach them productively.

Another factor that may affect the teachers' teaching methods is the training that the teachers received, education background, and experience in math instruction. There are three professional development interventions that demonstrated a shift in the prospective teachers' beliefs about reform-oriented mathematics learning and teaching practices, which are problem solving journals, structured interviews, and peer teaching (Timmerman, 2004). Teachers who were exposed to these interventions were able to easily instruct math in their classroom using innovative and engaging ways. During my interviews, I would be paying close attention to whether or not these teachers received these types of training.

Teachers' own motivation can also affect the way they plan their math lessons and instruct in the classroom. Mok (2002) found that teachers' development is due to self-as-agent, meaning their own personal values and fulfillment of the self's personality motivates them to continue teaching and improving in their areas. The teachers' self-confidence in their capabilities and own personal values can shape their attitudes towards teaching students. It's an important point because teachers, who don't have a goal and high confidence level, would more likely not care about the students' performance.

Along with personal goals and values, educational background can also be another factor that determines how teachers instruct. Teachers who have midrange years of teaching experience,

supervised more than five field experience students, work closely with an university supervisor, and have graduate-level preparation in supervision tend to be more effective teachers (Killian & Wilkins, 2009). Teachers who have a combination of these different qualities usually are able to create and have various types of learning methods to engage the students in math. In addition, many of the effective teachers also have master's degrees in teacher leadership. Teachers who have degrees in teacher leadership are more successful in flawlessly instructing the class without having trouble with classroom management. Also, teachers who had been exposed to a field of studies that show the usefulness for student achievement, testing and grading techniques were more likely to incorporate these foundations in their teaching methods as well (Gentile, 2003). If teachers are able to personally experience and be involved in various assessment tools, then they would have knowledge on the best way to use these tools in their classrooms. These additional educational backgrounds result in better teaching styles that produce more engagement within the classroom.

Along with educational background, the teachers' college major may not play an important role in the quality of the teachers' teaching methods. According to Cavanagh (2009), qualified teachers do not necessary need to have a math major in order to improve student learning in elementary and middle school. "Just superimposing a math major isn't going to guarantee anything. Teachers need to know their stuff, and they need to know how to apply it" (Cavanagh, 2009). He is arguing that it is not always about the teachers' knowledge of math content, but it is also crucial that the teacher knows how to convey these concepts to the students in the best possible way. Teachers who possess the "mathematical knowledge for teaching" are more likely to be able to explain the meaning of math problems to students in several ways, know how to use math language in class and keep track of where students get confused on the

problems, while at the same time teachers need to be adept in covering all of the important math concept (Cavanagh, 2009). This shows that the requirement of teachers having to be math majors in college does not necessary mean that they will be the most effective math teachers. Instead, administrators and researchers should pay more attention on how well the teachers know their math materials and if they are capable of conveying this math information in the most concise and understanding format. I will keep this in mind as I am doing my research on the factors that influence effective engaging teachers' teaching methods.

These relevant research articles provided me with background knowledge on which type of methods would yield higher students' engagement and participation. I have basic knowledge now that factors like mastery learning knowledge, work experience with a supervisor, teachers' personal drive, strong teacher-student relationships and the quality of the teachers' knowledge on math can affect how engaging teachers are in instructing and leading students. With this information, I want to further to examine what kind of teaching methods are currently being implemented in an urban middle school to engage students in math. I also want to observe if there are other factors that can influence teachers' math teaching styles that may or may not result in engaging students.

Research Question

What types of teaching methods do teachers use to engage students in Math departments in an urban middle school? What are the influential factors that play a role in the methods that Math teachers use inside the classroom?

Methods

I decided that I want to use qualitative research methods of interviews to conduct my study because I wanted to personally experience the different math teaching styles that are used inside an urban classroom. Also, I wanted to interview the teachers myself so I can have a better understanding of who they individual are and how their characteristics relate to the way they teach inside the classroom. After deciding this, I gained permission to an urban middle school, and this urban middle school will be known as the H school in my paper. I was only able to interview and observe four math teachers at the H school. Each interview was about forty minutes long, and all the interview questions were open-ended questions. I initially constructed a structure set of questions for all of the four teachers but then I altered the questions depending on each teacher's responses during the interview (see attached appendix for the list of interview questions). The teachers' were randomly selected at the school.

During my time at the urban middle school, I defined and determined what it means to be an "engaging teacher". I also investigated the types of teachers that are in the math classrooms and if their methods are engaging to their students. All of the teachers had to sign a consent form before I started the interview and classroom observations. Throughout this whole paper, I have given the school and the teachers a pseudonym in order to ensure confidentiality and protect the privacy of the teachers.

Data & Analysis

In the H school, there are several different and interesting teaching methods that teachers use inside the urban middle school classrooms, which involve a combination of direct instruction, verbal interactions and hands on activities. The individual teacher's teaching methods can be

influence by various types of experience, training, and personality, which are crucial for becoming an engaging teacher. Furthermore, teachers do not necessary need to be math majors in order to be qualify to teach engagingly in the classroom. Most important of all, teachers need to have a strong foundation in teaching from the very beginning in order to be an engaging teacher. It's the quality and quantity of the teacher's teaching experience that would affect how engaging the teacher can be in a math classroom.

Engaging Teachers

For my project, I determined engaging teachers as teachers who frequently use verbal instruction in the lessons. There also needs to be a high rate of student participation in the math classroom. The teachers also need to be able to implement innovative methods and develop a strong and trusting relationship with the students.

Ms. Bush

Many of these students in his class are alert and attentive. When the students in his class become rowdy and start talking, he either just needs to put his arms up to quiet them down or give them a stern look. The students automatically focus on their work. Based on my observations in the H school, Ms. Bush is one of the most engaging math teachers out of the four I interviewed because instead of just direct instruction, she is constantly involved in verbal instruction with the students. In the beginning of the class, she would have music playing in the background for four minutes, so the students would settle in and be ready to do the "Do Now". The "do now" are a set of questions that the teacher assigns to the students in the beginning of the class that will cover materials from the previous lessons and homework problems. She believes that you need to "try as much as you can to make the math problems real to the kids' life

in some way. If your teaching fractions, you know cut up a pizza, don't just cut up a rectangle on the board" (Ms. Bush). Furthermore, she permits the students to have an open discussion with him when they do not agree on a solution to a problem. This grants the students the opportunity to explore and develop a better understanding of the math concepts on their own. One day during his 8th grade geometry class, she drew a rectangle with two congruent angles and asked the class, "If these two sides do not exist, will you still have two parallel lines?" Everyone agrees but then a student asked "what if you erase the other sides of the diagram, would the angles still be congruent?" The teacher does not immediately correct the student, instead she draws out the scenario that the student is posing and she guides the student with questions. This discussion continues for at least fifteen more minutes, with several students participating and going up to the board to demonstrate what they think the answer is.

By the end of the 15 minutes, the students concluded that "they can prove the top and bottom angles are congruent but the z on the other side might or might not be congruent because we don't know any more information about the other two sides." Ms. Bush then gets up from her seat and confirms this finding by telling them "you need more information to prove if the lines are parallel" (Ms. Bush). All the students continue to ask questions and every single student in this class was actively participating. When some students are not participating, Ms. Bush would call on them to answer her question, in order to pull them into the lesson. Ms. Bush can obtain and retain the students' attention throughout the 80 minutes of class and she does this with her ability to discipline her students in a structured classroom setting.

Ms. Top

Ms. Top can also be considered one of the most efficient teachers in math engagement at H school. In her class, students are attentively taking notes and raising their hands to answer her questions. She uses the smart board to demonstrate diagrams and word problems, but at the same time she asks questions that require several students to answer as she explains the problems. Many students would raise their hands and patiently wait to be called on and she would also call on unexpected students to answer as well. She is constantly monitoring the room to assist any students who may need her help. When she notices a student is looking into space and talking to other people, she would walk to him and kneel down to help him refocus on the problem. Her tone is soft but serious at the same time. She would raise her voice if she needs to calm the class down. She tends to give a lot of quizzes and vocabulary sheets to the class because she believes that it will help track their progress and allow the student to figure out where he or she still needs to work on.

Ms. Smiley

Ms. Smiley is the third most engaging math teacher at H school. Within her classroom, she tries hard to engage her students with limited direct instruction with combination of verbal discussion between the teacher and the kids, and the regular use of games. She teaches two regular math classes and one special education math class. In her special education classes, most of the kids are interactive with her, while she teaches. The students are constantly raising their hands and asking questions about things that they need clarification on. Half of the class would be involved in her verbal discussions. She also engages the students to a certain extent by implementing games that enable the students to experience probability with their own eyes and

hands. Some of the students would get restless as class progress and start to have their own conversations. She tries to quiet her student down and make them re-focus when they get rowdy but she is not as successful as Ms. Bush or Ms. Top in achieving a focus classroom. Most of the time, 4 or 5 students would be roaming around the classroom, while she is involved in a class discussion with the class.

Ms. Reese

Ms. Reese is the fourth engaging teacher because she often lectures in front of the classroom, while the students listen and take notes. She tries to have a verbal interaction during this direct instruction but many students tend to not participate. There are a lot of worksheets and homework problems that they work on during class. The pace of the class is pretty slow because she frequently has to stop to take care of students' misbehavior. In her math classes, she struggles just as much as Ms. Top in class management. One day two students were arguing in a corner about which sneakers are better and four students eventually became involved in the conversation as well when they were supposed to be working on their worksheets. Teacher 4 was helping a student on the other side of the room and she doesn't address this until four minutes, while the noise level from that group were pretty loud. When she approaches them, she tells them to focus on their work but this was not effective at all. The students after a second started talking to other people again. These side conversations and student outbursts constantly happen in her 80 minute lesson plan, which interferes with her goal of trying to engage these students. Only 3 students were regularly participating when she is instructing to the class and the rest were either staring into space or walking around and talking to their neighbors.

Influential Factors

After interviewing the teachers, I found that the most influential factors that influence teachers' teaching method are the quality and quantity of the teaching experience, quality of the teaching training, and the personality of each individual. In addition, I found that personal motivations and qualities of being a college math major have no influence on teachers' teaching methods.

Ms. Bush

Teacher 3 describes himself as "a big old guy with a deep booming voice, 6'2, weighing 240 pounds" (Ms. Bush). She never had a problem with public speaking and she is very confident in speech. She is not shy and not afraid to tell students what they need to do in her classroom. She definitely does not have any problems with class management because as she says, "I am absolutely intimidating and it can be useful if I need to quiet them down" (Ms. Bush). But because of her intimidating nature, she has to rein that in a bit because she had experienced kids who are afraid to ask her questions. But she learned to balance it by kneeling next to the kids and being a jokester with silly ties and jokes. This allows the students to respect Ms. Bush but at the same time they seem to feel comfortable to approach her for help.

Her major was history and economics. She did not intend to become a math teacher, in fact she was horrible at math as a student. The reason she chose to teach math was because of economic issues. "I pursued teaching math because I need a job" (Ms. Bush). It is quite interesting that her personal motivation was not his passion for math, instead it was the desire for a job but she is still successful in student engagement in his classroom. Furthermore, her major was not math; therefore personal motivations and majoring in math may not be the most

important factor in deciding if a teacher is effective in math student engagement. It may vary from teacher to teacher.

Furthermore, teaching experience plays a key role in Ms. Bush teaching methods. H school is her third school and this is her twenty-six years of teaching, with eight years at H school. As mentioned before she didn't plan to become a teacher, therefore she did not enroll in any education courses in college. Instead after a couple years in construction work, she decided it's was too hard. She ended up getting her master and student teaching at a university. She actually did not get many teaching experiences before she taught at her first school but she was excited to just started teaching in front of the kids during her master program. "By the end of the first week, I just started teaching" (Ms. Bush). It wasn't a challenge for her to just dive into teaching and she liked it a lot. Experience definitely helped her develop strategies that worked in student engagement but it seems that she was just a natural to begin with. But experience can really make a difference for teachers who already have a strong foundation in instructing from the beginning.

Ms. Top

Ms. Top has been teaching for 30 years. She definitely has a lot of teaching experience, just like Ms. Bush, and this seems to work in her favor. She taught at high schools for 23 years and now she has been teaching at H school for 7 years. She had formal training at a university right after college.

One of the most significant differences between Teacher 1 and Teacher 3 is Teacher 1's personal motivation. She chooses to teach math, not because she wanted a job, but because "math is so important. It comes up everywhere in their life later on and I found it easier to

convince students how important the subject I was teaching in" (Ms. Top). She made a decision to teach math because she wants to help and prepare students for whatever comes next and it was so clear to her that they need math in order to move on in life. This motivated her to continuously altering her lesson plans every year until she is satisfied with it. Her passion for math and her two majors allowed her to build a strong foundation for teaching, along with the help of experience over the 30 years. Her major actually helped her realize that she wanted to teach math more than history, whereas majors had no relevance to Ms. Bush's teaching methods.

Ms. Top is not as outspoken and as strict as Ms. Bush. She is a perfect example of how teachers do not all have to be necessary strict but need to know how to balance out between being too soft and too strict. "I think I am strict although I also think I am not as strict as some people I know. I am I am too soft" (Ms. Top). Although she has a problem with disciplining her kids, she found a solution which is to keep them busy and engage. "But with do now's, I see a change in the class, it sets the tone of the class for the next 80 minutes, so I think that has always been my answer to what I can do to make them engaged" (Ms. Top). She has a different personality than Ms. Bush but she still is able to engage the students with her type of personality.

Her methods are different from Ms. Bush who believes in a combination of direct instruction, problems that involve real life situations and verbal instruction. "I think I am also more sensitive to where I think the CMT did a disservice, where everything was hands on, but not everything will be hands on in reality" (Ms. Top). Due to this belief, she insists on building in tests and quizzes in her classroom to prepare the kids for reality. "I am a big believer in lots of quizzes along the way. The fact that my quizzes are always small points, most of the kids are going to say it's a fair system and they will respond well to it" (Teacher 1). Her quizzes are

supposed to let them know they are in the learning stage and allow them to assess how well they are doing.

Ms. Smiley

Ms. Smiley is one of those teachers that people would label as a teacher with potential. She just started her first year of teaching at H school. She is from a family of educators. Her education and job experience, personality and personal motivation impacted her teaching styles tremendously. For several years, she was a engineer. She then worked for an educational consultant and designed teacher booklets for No Child Left Behind and title 1 schools. She did not start teaching the traditional way; instead she worked in private tutoring in math and reading in her kids' schools whenever she was available. "I knew I wanted to be an engineer. I eventually wanted to go into teaching because my own math experiences were horrible until I got to college" (Ms. Smiley). The switch from mechanical engineer was not a sudden career move. She first wanted the practical experience of applying math on a daily basis before becoming a teacher. Her personal experience with math and science was horrible but if it wasn't for her family's encouragement, she would have turned away from these two fields. "I am a not a traditional teacher. I don't believe that is the best way to learn math and I knew I wanted to do it differently when I have the chance" (Ms. Smiley). Therefore, her education experience influenced her teaching methods because she refuses to teach traditionally in terms of basing her lessons on the textbooks and constantly using worksheets.

Her training and teaching experience are the reasons why she is struggling with classroom management. Her methods are successful in achieving student math engagement most of the time but her lack of behavior management interferes with that engagement. "The only

special education class I took at a college, which did not prepare me for the level of needs that these children need in my special education classes. I am modifying more work for that class with my gut feel" (Ms. Smiley). She even admits that she does not have adequate amount of special education training that allows her to really teach and manage these kids. She is planning on going back to school to get more training in this area. She also lacks the experience to know how to deal with classroom management. "It's a difficult thing, as a new teacher, classroom management probably is one of my biggest challenges. I haven't found anything that really works. The level of chitchat during class, I don't know how to deal with it yet" (Ms. Smiley). But although she is at a disadvantage, she is willing to change her ways by over planning every day because "if you have to kept them busy, because if you don't, they will keep you busy" (Ms. Smiley). This is her personality, which is willing to work hard because her passion is to teach these kids in the best possible way. Unlike Ms. Bush and Ms. Top, she doesn't have the 30 or 26 years of knowledge of how to deal with talking and behavior issues. Teachers that have an adequate amount of training in various education areas and a huge amount of experience would definitely be more effective in classroom management that would not interfere with the student math engagement.

Ms. Reese

She was a math major in college and decided to teach because she always had a passion for math. "Well, I thought I was good at explaining math but I don't know anymore. I always had a gift in communicating mathematics to my peers, so I thought I was going to be good in the classrooms" (Ms. Reese). Her personal motivation to teach was that she was passionate about math but she now seems to have doubt about how well she actually can teach. "I think one of the reasons why I am having a hard time because I think I am not challenging them enough. I need to

work on challenging them more" (Ms. Reese). It's interesting that she acknowledges that her teaching methods are not stimulating enough for these students, which fails to draw their attention and interest in math. According to Ms. Reese, these students at H school are smarter and at a higher level of learning than at the other schools she taught at. Furthermore, this demonstrates that Ms. Reese lacks a strong foundation in engaging students from the beginning.

Ms. Reese is actually an interesting case because she has 19 years of teaching experience in public schools but she is still struggling with class management and student engagement in her math classrooms. She has more experience than Ms. Smiley but Ms. Smiley, who just started teaching this year, is actually more successful in student math engagement than Teacher 4. Ms. Reese has taught at high schools for 17 years and this is her 2nd year at H school. Her total 19 years of teaching did not aid her at all in keeping her students under control and fail to engage students at the same time. Teaching experience was an essential factor in the other three teachers but this indicates that only having teaching experience is just not enough.

She is also very soft spoken and not very strict, just like Ms. Top but she doesn't have any strategies to help her be firm on the students. The students tend to take advantage on her being too nice, although she does try to send misbehaved students to the principal, but it doesn't seem to scare any of the students at all. Ms. Reese's personality didn't help her at all in engaging her students as much as Ms. Bush, Ms. Top, and Ms. Smiley's personality did.

Limitations and Challenges

One major limitation to this study is the amount of teachers I was able to interview and observe. Initially, I wanted to study high school math classrooms and teachers because they might have more freedom with playing around with the math curriculum. After many attempts to

gain access into the high schools, I was not successful but instead I was able to gain permission from the Principal at the H middle school. Due to the fact that it took me a whole month to gain access to a school, the math director at the H school was only able to give me four math teachers to work with. Therefore, my sample size is small and I know if I have a bigger sample size, I might have been able to find more differences between the teachers. I also wanted to compare the math teachers in different schools but due to access issues and time constraints, I was not able to implement this in my study. It would be interesting to see if the teacher qualities and teaching methods in one school are the same or different in other schools.

Implications

This study is significant because Math is an important subject that all students would need in their future endeavors. Math is such a fundamental tool that everyone needs in their daily life. Therefore, we need to ensure that we have adequate teachers that can engage our students to learn the math concepts they need to know. Furthermore, this study can play an important role in the math teacher hiring process. Administrators can use the findings from this study as a guide to help them figure out what type of teacher qualities they should pay attention to in order to ensure that they hire teachers that are capable of engaging the students in math.

Conclusion

Ms. Bush and Ms. Top both are very qualified in their teaching experience, training, education background, personal motivation, and personality. Although they differ in many aspects of these factors, these factors primarily shape how they engage their students. This allows them to use combinations of worksheets, games and verbal discussion styles with the students. Ms. Smiley is third in line to be considered in effectively engaging her students because

she has a lot of personality, personal motivation, and unique education background. But she still lacks in areas such as teaching experience and extensive training. As for Ms. Reese, she has a lot of teaching experience but the quality of her teaching experience is lacking. She is still learning to manage her class in terms of behavior and engaging them in the lesson. She isn't as qualified in the different influential factors like Ms. Bush, Ms. Top, and Ms. Smiley are.

There's not one type of pedagogical technique that produces an engaging teacher. Teachers are shaped by various experiences, training, and personality. There are also factors like the qualifications of being a math major and personal motivations are not as important in influencing teachers' teaching styles and their level of engagement. The most important aspect is that teachers need to initially have a strong background in teaching, where there needs to be quality and quantity amount of teaching experience, in order for these teacher qualities to be influential.

Bibliography

Bayazit, Ibrahim & Gray, Eddie. "Understanding Inverse Functions: The relationship between Teaching Practices and Student Learning." *International Group for the Psychology of Mathematics Education* 28 (2004): 1-8. Web. 5 Oct. 2009.

Cahnmann, Melisa S. & Remillard, Janine T. "What counts and how: mathematics teaching in culturally, linguistically, and socioeconomically diverse urban settings." *The Urban Review* 34.3 (2002): 179-204. Web. 3 Oct. 2009.

Cavanagh, S. (2009, November 25). Majoring in Math Not Always a Classroom Plus. *Education Week*. Retrieved from http://www.edweek.org/ew/articles/2009/11/25/13mathteach.h29.html?r=193565759.

Gentile, J. Ronald & Verdinelli, Susana. "Changes in Teaching Philosophies Among In-Service Teachers After Experiencing Mastery Learning." *Action in Teacher Education* 25.2 (2003): 56-66. Web. 3 Oct. 2009.

Killian, Joyce E, & Wilkins, Elizabeth A. "Characteristics of Highly Effective Cooperating Teachers: A Study of Their Backgrounds and Preparation." *Action in Teacher Education* 30.4 (2009): 67-83. Web. 3 Oct. 2009.

Llyod, Gwendolyn M. & Wilson, Melvin R. "Sharing mathematical authority with students: the challenge for high school teachers." *Journal of Curriculum and Supervision* 15.2 (2000): 146-69. Web. 3 Oct. 2009.

McKinney, S. E., Chappell, Shannan, Berry, R.Q, & Hickman, Bythella. An Examination of the Instructional Practices of Mathematics Teachers in Urban Schools. *Preventing School Failure* 53.4 (2009): 278-284. Web. 6 Oct. 2009.

Mok, Yan Fung. "Teacher Growth: the Formation and Pursuit of Personal Values." *Interchange* 33.2 (2002): 115-38. Web. 3 Oct. 2009.

Timmerman, M.A. The Influences of Three Interventions on Prospective Elementary Teachers' Beliefs About the Knowledge Base Needed for Teaching Mathematics. *School Science and Mathematics* 104.8 (2004): 369-382. Web. 6 Oct. 2009.

Wolk, Ronald A. "Why We're Still At Risk." *Education Week* 28.29 (2009): 36. Web. 3 Oct. 2009.

Appendix A

Teacher Interview Questions

Personal Information

1. What is your name?

2. What are the math levels and grades that you currently teach?

3. How long have you been teaching at Hartford Magnet Middle School?

4. Can you tell me about where you are from originally? How would you compare it to Hartford? Would you describe it as really different or similar to Hartford? Are you living in Hartford currently or still living in your hometown?

5. What was your first reaction when you first started working at the H School? Can you please describe your transition period? Did it take you a long time to adapt to the new environment or you felt right at home with all the students and teachers?

Teaching Styles

6. Can you please elaborate for me regarding your education background, starting from elementary school? Like, what type of school was it? (private or public, school size, racial makeup).

7. I would like to know more about your educational background. Can you talk more in detail about where you went to undergraduate school and the road you took to get here today? What major? How did you get involved in this major? (Where did you attend undergraduate school? Where did you attend graduate school? Did you work closely with any of the professors there?)

8. Why did you pursue teaching math? Are you going to keep pursuing this career or is this just for now?

9. What motivates you to do this?

10. Can you talk more about what jobs you work at before you took this teaching job here? (What kind of experience did you have before teaching here? What kind of training for education were you involved in?)

11. Describe the students' interest in math at H school for me please. Do you think these students would consider math as one of their favorite academic subjects? Is it a struggle for them?

12. Please talk about the types of expectations you have for your students in your math classroom. How would you describe their math performance? Do you have different expectations for different math levels and does that affect your teaching style?

13. Can you please talk about how you begin your math lessons? What type of method do you prefer using? I notice there are smart boards, whiteboards, and a lot of worksheets given out. Is that helpful in students' engagement in the lesson? Which one do you use the most? (Do you prefer having students involve in group work and discussion style or do you like to just lecture and have the students answer one by one?) (Do you like to implement innovative methods in your classroom or do you like to follow by the books?)

14. Do you think your students are comfortable approaching you at anytime for help? How do you offer your help? (like do you have hours after school for extra help, do you make yourself welcoming?)

15. I would like to know more about you as a person. Can you describe yourself to me? (like would you describe yourself as outgoing, shy, funny, strict and so on?) Are you comfortable

with public speaking? (presenting in front of students – is that easy for you or you have to prep yourself every day?) Did this take years to perfect?

16. Also, I have seen that some of your classes have behavior problems, like tend to act out, and walk around. How would you deal with that on a regular day? Can you explain in detail? (do you stop the whole class to quiet him or her down or do you keep going hoping that they would get the idea?)

Appendix B

Table 1

Engaging Teachers

Rank of Engaging Teachers	Teaching Methods	Reasons Why Teachers Are Engaging
Mr. Bush is the most engaging teacher	"try as much as you can to make the math problems real to the kids' life in some way. If you're teaching fractions, you know cut up a pizza, don't just cut up a rectangle on the board."	1. Students respect Mr. Bush. 2. A lot of student participation. 3. Students are actively asking questions. 4. Fast pace lesson and lot of good content.
Ms. Top is the second most engaging teacher.	"I am a big believer in lots of quizzes, they are always small points, most of the kids are going to say it's a fair system and they will respond well to it."	1. Students are constantly asking questions and actively listening. 2. Uses a lot of worksheets as she lectures. 3. Lots of diagrams.
Ms. Smiley is the third engaging teacher.	Engage her students with limited direct instruction with combination of verbal discussion between the teacher and the students. Constant use of games.	1. Students somewhat participate. 2. Struggle with classroom management. 3. Uses mints as incentives. 4. A lot of games.
Ms. Reese is the fourth engaging teacher	Direct instruction with verbal interaction but at a very slow pace, due to poor class management skills.	1. Only 3-4 students are listening and participating. 2. Students are constantly walking around having conversations. 3. Worksheets are usually incomplete.

Appendix C

Table 2: *Influential Factors*

Teachers	Teaching Experience	Training	Personality	Majors	Personal Motivation
Mr. Bush	26 years at 3 schools	Master program at University of Arlington after college. "By the end of the first week, I just started teaching."	"I am absolutely intimidating and it can be useful if I need to quiet them down. I am also a jokester."	Economic and History	"I pursued teaching math because I needed a job."
Ms. Top	30 years at 4 schools	Formal education training right after college at University of Hartford.	"I think I am strict, although I also think I am not as strict as some people I know. I am too soft."	History Major and Math minor	"Math is so important. It comes up everywhere in their life later on and I found it easier to convince students how important the subject I was teaching in."
Ms. Smiley	1st year	Worked as a mechanical engineer for many years. Went back to school last year to get teaching certificate.	"I like to over plan every day because "you have to keep them busy, because if you don't, they will keep you busy."	Mechanical Engineer	"I am not a traditional teacher. I don't believe that it is the best way to learn math and I knew I wanted to do it differently when I have the chance."
Ms. Reese	19 years at 2 schools, tutoring programs	Formal education training after college but started working in tutoring centers first.	"I think I am too soft and nice."	Math Major	"I like Math since I was young and thought I was good at explaining it to people, so I pursued teaching."